



Research Article

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LEVELS OF TRACE ELEMENT OF FENNEL SEEDS AND ITS ANTIMICROBIYAL ACTIVITY

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Abstract

In this study, levels of trace element and antimicrobial activity of the extracts of fennel plant (*Foeniculum vulgare*) collected from Elazig-Turkey area were investigated. Fennel seeds have been known to be able to regulate menstruation, alleviate the symptoms of female climacteric syndrome, and increase libido. Digestions and analyses of fennel samples for trace elements were performed with acids mixture of concentrated HNO₃ and HClO₄ by using microwave oven in PTFE vessel and ICP-OES. The antimicrobial activity of the plant extracts (methanol, isopropanol and hexane) was assessed by disk diffusion method and compared with three commonly employed antibiotics. Organic extracts had a moderate effect against all test organisms (*Bacillus subtilis* ATCC6633, *Escherichia coli* ATCC 11230, *Pseudomonas aeruginosa* ATCC29212, *Pseudomonas fluorescens* RSKK 240, *Aeromonas hydrophila* ATCC 7966, *Staphylococcus aureus* ATCC 25923, *Salmonella typhimurium* MU 80, *Shigella sonnei* MU 57, *Candida albicans* ATCC 90028 and *Candida parapsilosis* ATCC 22019). Therefore, these properties show that the plant has a potential for use in pharmacy and this antimicrobial screen also warrants further studies on antibiotic-resistant strains and other pathogens.

Keywords: *Foeniculum vulgare*, fennel, trace elements, antimicrobial activity, pathogens

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1. Introduction

Fennel (*Foeniculum vulgare*) is a well-known umbelliferous plant (Fig 1). For centuries, Fennel fruits (seeds) have been used as traditional herbal medicine in Europe and China (Fig 2). It is native to southern Europe and the Mediterranean area. The seeds of this plant have

been known to be able to regulate menstruation, alleviate the symptoms of female climacteric syndrome, and increase libido (Albert-Puleo, 1980; Mahfouz and Sharaf-Eldin, 2007). Fennel also possesses emmenagogue and galactagogue properties (Ostad et al., 2001). It has been reported that Fennel could be used in the pediatric colic and some respiratory disorders due to its anti-

spasmodic effects (Ozbek et al., 2003; Jeliaskova et al., 2003; Savino et al., 2005). Seeds of it are used in folk remedies for treatment of dysmenorrheal. Fennel (in Turkish "Rezene") is natively found in North and West regions of Turkey. It is cultivated for the herb as a spice (flavorings salads) and medicine in Turkey. Powders or tablets (0.5-1 g) of seeds, or its infusion forms (2%) are taken 2-3 times per day. As a medicinal plant, Fennel has been used as an antispasmodic, carminative, diuretic, lactation stimulant, and as dressings for wounds in Turkish traditional medicine (Baytop, 1984).



Figure 1. The picture of fennel plant



Figure 2. The seeds of fennel plant

In this study, levels of trace element and antimicrobial activity of the extracts of fennel plant (*Foeniculum vulgare*) collected from East Anatolia-Turkey area were investigated.

2. Materials and Methods

2.1. Apparatus

Perkin-Elmer 3100 inductively coupled plasma optical emission spectrometer (ICP-OES) (Norwalk, USA). Microwave-assisted acid digestions have been made using a Premier microwave system.

2.2. Reagents

All water used was distilled and then deionized using a Millipore (Bedford, MA, USA). Stock standard solutions of the metals (1000 mg L⁻¹) were supplied by Merck (Ciftci, 2014; Ciftci and Er, 2015).

2.3. Digestion and trace metals analysis procedure

Seed samples were washed, dried and were turned powder by mill. Dried samples were weighed (0.4 g). They were digested with 8 mL of HNO₃ (%65 w, Merck, Darmstadt), and 1 mL HClO₄ (%60 w, Merck, Darmstadt), in a microwave system in PTFE

(polytetrafluorethylen) vessels (digestion conditions are; 650W, 5 min.; 800W, 10 min.; 650 W, 5 min.). PTFE vessels were kept for an hour to cool and were carefully opened. Colorless solution was transferred into a beaker. Afterwards, final volume was diluted to (10.0 mL) with 0,1M HNO₃. The blank digests were carried out in the same way. Determinations of the elements in all samples were carried out using ICP-OES.

2.4. Antimicrobial activity

The antimicrobial activity of the plant extracts (methanol, isopropanol and hexane) was assessed by disk diffusion method and compared with three commonly employed antibiotics. Organic extracts had a moderate effect against all test organisms (Bacillus subtilis ATCC6633, Escherichia coli ATCC 11230, Pseudomonas aeruginosa ATCC29212, Pseudomonas fluorescens RSKK 240, Aeromonas hydrophila ATCC 7966, Staphylococcus aureus ATCC 25923, Salmonella typhimurium MU 80, Shigella soneii MU 57, Candida albicans ATCC 90028 and Candida parapsilosis ATCC 22019).

3. Results and Discussion

The contents of Mg, Fe, Mn, Zn, Cu, Ni, Cr, Al, Pb and Co were determined 144.1, 213.5, 40.04, 20.12, 15.5, 5.04, 2.45, 1.11, 0.22 and 0.14 µg g⁻¹ (dry matter) respectively, Table 1.

Table 1. The levels of trace elements in fennel seeds

Metals	Concentration (µg g ⁻¹)	Metals	Concentration (µg g ⁻¹)
Mg	144.1	Ni	5.04
Fe	213.5	Cr	2.45
Mn	40.04	Al	1.11
Zn	20.12	Pb	0.22
Cu	15.5	Co	0.14

The fennel was found to be rich in trace elements, suggesting that they may be valuable for medical, cosmetic and food industry uses. Additionally, its antimicrobial properties show that the plant has a potential for use in pharmacy and this antimicrobial screen also warrants further studies on antibiotic-resistant strains and other pathogens. The data may also be useful for will be done researches.

Therefore, these properties show that the plant has a potential for use in pharmacy and this antimicrobial screen also warrants further studies on antibiotic-resistant strains and other pathogens.

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